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1. INTRODUCTION

During the last years, population health has been considered as a fundamental aspect in all countries and one of the most important indicators of life quality. In this way, policy makers have an increased interest in social inequalities in health and on those characteristics of individuals that are related to health. Traditionally, population health has been measured through different indicators such as life expectancy, infant mortality, death rates, disability, self-assessed health, happiness or well being. However, health and its outcomes continue being a complex matter and therefore difficult to measure. By this way, individuals' health has being specified as an individual characteristic function based on different inputs (Grossman, 1972; Fuchs, 2004). Thus, one of the most commonly used indicators of individuals' health status is Self-Assessed Health (SAH) which is classified into five categories reflecting negative health rating (bad or very bad health) *versus* positive or neutral health ratings (very good, good or fair health). In this sense, there exist important relationships between health and socioeconomic status (Salas, 2002; Adams *et al.*, 2003), between health and lifestyles (Contoyannis and Jones, 2004) and between public health expenditure and SAH status (Rivera, 2001). On the other hand, different authors have analysed the links between income and health. Mangalore (2006) tests that many social and economic factors influence an individual's probability of having a health problem or making use of health care facilities. Cantarero et al. (2005) provide new evidence in order to explore the relationship between income inequality and health in the European Union using aggregate data and panel techniques. Wildman et al. (2003) discuss the aggregation problem when the relationship between health and income inequality is studied.

However, despite the importance of the study of income and health mobility, few attempts have been made to measure intergenerational mobility in the European Union. Most of the recent papers are focused on the study of income mobility. Thus, Di Pietro et al. (2003) examine the intergenerational transmission of socio-economic status using data from the 2000 wave of the Bank of Italy's Survey on Household Income and Wealth and analysing the relationship between the occupational status of parents and their children. Carmichael (2000) examines the link between parents occupational attainment and that of their children using data from the British Household Panel Survey (BHPS) concluding that individual attainment is strongly influenced by parental status in Britain.

In recent papers, some authors have focused their attention on the dynamics of health (Hauck and Rice, 2004; Jones and Lopez-Nicolas, 2004). However, health mobility studies are mainly concerned with the evolution over time of individuals' health[1]. However, empirical analysis of intergenerational health dynamics has not received much attention although there exists evidence suggesting that sons' reported health depends significantly on the SAH of their parents. In this way, Case *et al*. (2004) suggest that health is a potentially important transmission mechanism for the intergenerational correlation of income and education. These authors find that, controlling for parental income, education and social class, children who have poor health also have significantly lower educational attainment, poorer adult health and lower socio-economic status. More recently, Doyle *et al*. (2005) have investigated the relationship between key parental characteristics of education and income on child health using data from the Health Survey of England.

In this paper, we will focus on intergenerational health mobility in Spain using the information contained in the European Community Household Panel (ECHP). We will use the econometric framework proposed by Solon (1992) and Zimmermam (1992)

[1] Hauck and Rice (2004) identify whether individuals within different social and economic strata experience differential mobility over time in their respective mental health distributions using the BHPS. Jones and Lopez-Nicolas (2004) define an index of health-related income mobility as one minus the ratio by which the concentration index for the joint distribution of longitudinal averages differs from the weighted average of the cross sectional concentration indices.

considering averages of individual's health on subsequent years as a measure of long term health status. Following these theoretical and methodological approaches, health mobility can be analysed across socio-economic groups, educational attainment and social class group.

The paper is organised as follows. Section two describes the data sources we have used and characteristics of the variables involved in our analysis together with the principal methodological decisions we have taken. In Section three, we describe intergenerational income health from a theoretical and empirical framework and finally, Section four gives a summary and conclusion.

2. DATA DESCRIPTION

The source of data used in this paper is taken from the ECHP for Spain. This survey contains data on individuals and households for the European Union countries with eight waves available (1994-2001). It was elaborated for the first time in 1994 and it was composed by 60,500 households (approximately 170,000 individuals). In the case of Spain, the first wave was composed by 7,206 households (23,025 individuals).

The variable we use as a proxy of individual's health status is the SAH that each individual reports of their own health status and the possible responses are ordered qualitatively. Thus, SAH variable is a subjective response to the question "How is your heath in general?" and it takes the values "1" (very good), "2" (good), "3" (fair), "4" (bad) and "5" (very bad).

The ECHP is particularly useful for the study of intergenerational health mobility because it provides data on the socio-economic status of both respondents and their parents. The starting point for this analysis of mobility is the existence of information for the same individuals in eight different periods. Thus, it is possible to study correlations in SAH. As an example, FIGURE 1 shows the distribution of SAH (Sons *versus* Fathers) for year 2001[2] and it suggests the different pattern of this variable. The sample mean age for sons in the first wave is less than 30 (24.11 years old) while the sample mean for fathers is 55. Obviously, sons are observed at an earlier stage of their life cycle. This fact justifies that their mean SAH is lower and the standard deviation of their SAH is higher. Note that lower SAH means better health.

3. INTERGENERATIONAL HEALTH MOBILITY: THEORETICAL FRAMEWORK

Although there exist different approximations for the study of income mobility (Prais, 1955; Shorrocks, 1978; Bartholomew, 1973; Hart, 1976), there exist few attempts to measure intergenerational health mobility. In this paper, we analyse the level of dependence on inherited conditions and the potential for intergenerational health mobility in Spain. In particular, we study the link between parents' self-assessed health and that of their children.

The basic model is the following:

$$h_{1i} = \rho \, h_{0i} + \varepsilon_i \,, \tag{1}$$

where h_{1i} represents self-assessed health for a son in family i, h_{0i} the same variable for his father and ρ the correlation between h_{0i} and h_{1i}, and ε_i is an error term. However, downward biases in the intergenerational correlations are generated because of the use of

[2] Similar results are obtained for the other waves.

short-run proxies (for instance, using only single-year measures of health) and because of the characteristics of the data (Solon 1989).

So, the previous model can be extended incorporating age profiles. Thus, son's SAH in year *t* can be expressed as:

$$h_{1it} = h_{1i} + \alpha_1 + \beta_1 A_{1it} + \gamma_1 A_{1it}^2 + \upsilon_{1it}, \quad (2)$$

where A_{1i} is the age of the son from family *i*. Also, parent's health status in year *s* can be expressed as:

$$h_{0is} = h_{0i} + \alpha_0 + \beta_0 A_{0is} + \gamma_0 A_{0is}^2 + \upsilon_{0is}, \quad (3)$$

where A_{0is} is the age of the father (or mother) from family *i* in year *s*. Combining these equations, individual's observed status in year *t* can be expressed as a regression function of parent's observed status in year *s* considering age for both parents and individuals. However, estimates based on averages of several years of data are preferred over those in a cross-section due to the reduction of the effects of transitory variation in the measured variable (Solon, 1992; Couch and Dunn, 1997). Thus, taking into account the errors in variables bias, we consider average parent's health status over *T* years, so the model considered is:

$$h_{1it} = (\alpha_1 - \rho\alpha_0) + \rho\overline{h}_{0i} + \beta_1 A_{1it} + \gamma_1 A_{1it}^2 - \rho\beta_0 \overline{A}_{0i} - \rho\gamma_0 \overline{A_{0i}^2} + \varepsilon_i + \upsilon_{1it} - \rho\overline{\upsilon}_{0i}. \quad (4)$$

One important aspect is the definition of the individuals' SAH. For the sons we have considered the response to the question "How is your health in general?" and it takes the values "1" (very good), "2" (good), "3" (fair), "4" (bad) and "5" very bad. For the fathers we have built a dummy variable which takes value one if fathers' response is good or very good health and zero otherwise.

In this way, regression analysis is used through specifying an ordered probit model (Greene, 2003). Results using STATA 8.0. are shown in TABLE 1. Also, we have tested the specification of the models using a RESET test which suggests that the models are not miss-specified. We can observe that there exists a negative and highly significant relationship between son´s SAH and fathers´ health. Thus, if parent's health is good or very good, the probability of the son´s reporting good or very good health is higher.

Furthermore, we are interested in the impact of parental health on child health outcomes (controlling by the age), so we are going to compare these results with those obtained including in the analysis other instrumental variables such as household income and parental educational attainment. In fact, there exists a significant and positive effect of income, with children in poorer families having significantly worse health than children from richer families (Case *et al*., 2002).

Our income variable is equivalised annual net household income adjusted using OECD modified scale to take into account household size and composition. In this sense, we have used household information rendering the component family by using equivalence scales. In this case, we use the logarithm of household´s income (OECD modified scale) taking into account the concavity in the health-income relationship (Gravelle, 1998).

The second group of variables are referred to the maximum level of education completed. In the ECHP, education is classified into three categories based on ISCED classification: less than secondary level (ISCED 0-2), second stage of secondary level (ISCED 3) and third level (ISCED 5-7). Thus, a dummy variable which takes value 1 if parental educational attainment is less than secondary level has been included.

The econometric model that has been used to deal with these ordered categorical variables is the ordered probit model. However, the coefficients on the explanatory variables in the ordered probit model have a qualitative interpretation (Jones, 2001). Thus, a positive coefficient means that an individual is more likely to report a higher category of SAH. That is, worse health. On the other hand, a negative coefficient implies individuals are likely to report good or very good health. TABLES 2-3 show the estimates for the ordered probit model obtained using the method of maximum likelihood estimation. These Tables include coefficients and z-ratios.

Thus, the qualitative interpretation is that those individuals whose father report good or very good health are more likely to report good or very good health. So, we will say that there exists "Parents' Health Effect".

However, we are also interested in the quantitative implications of these results. So, we have considered a new statistical model in which our dependent is a dichotomy variable which takes a value of 1 if the individual (son or daughter) reports good or very good health. As previously, factors such as age, average parents' health and other instrumental variables (household income and education) could be relevant in explaining whether an individual reports good or very good health. In this way, we will use a latent variable interpretation (Jones, 2001; Greene, 2003) through probit models estimated by maximum likelihood estimation. Results for sons and fathers relationships are presented in TABLES 2 and 3.

Also, we have calculated marginal effects (for the continuous explanatory variables) and average effects (for the binary explanatory variables). On average the probability of a men whose father reports good or very good health is between 5 percent and 10 percent more than for the reference individual (see TABLE 2). Thus, a high value shows individuals' health is influenced by his/her parents' SAH. On the other hand, a low value indicates a very mobile society in terms of health where individuals' health does not depend on his/her parents' ones. Similar results are obtained when we consider mother-son pairs, father-daughter pairs and mother-daughter pairs.

4. CONCLUSIONS

Despite the importance of the study of health mobility, few attempts have been made to measure intergenerational mobility not only in the European Union but also in other countries such as United States. In this sense, although there exists a growing and new literature on health mobility, we still know very little about intergenerational health mobility.

Therefore, this paper is concentrated on possible intergenerational correlations measuring the link between an individuals' health and his/her parents'. In this paper, son-father pairs have been considered and we can conclude that those individuals whose parents report good or very good health are most probably to report better health. So, we will say that there exists "parents health effect".

We have studied the impact of both paternal and maternal influences on child health outcomes testing that individuals' health is influenced by their parents' health. We can conclude that on average, in Spain and using the information contained in the ECHP

(1994-2001), the probability of an individual whose father reports good or very good health is between 5 percent and 10 percent more than for the reference individual. Thus, the results obtained suggest that although there exists strong influence between personal characteristics (age, gender and household composition), education level, household income and perceived health status, it should be considered the relationship between individuals' SAH and their parents' SAH.

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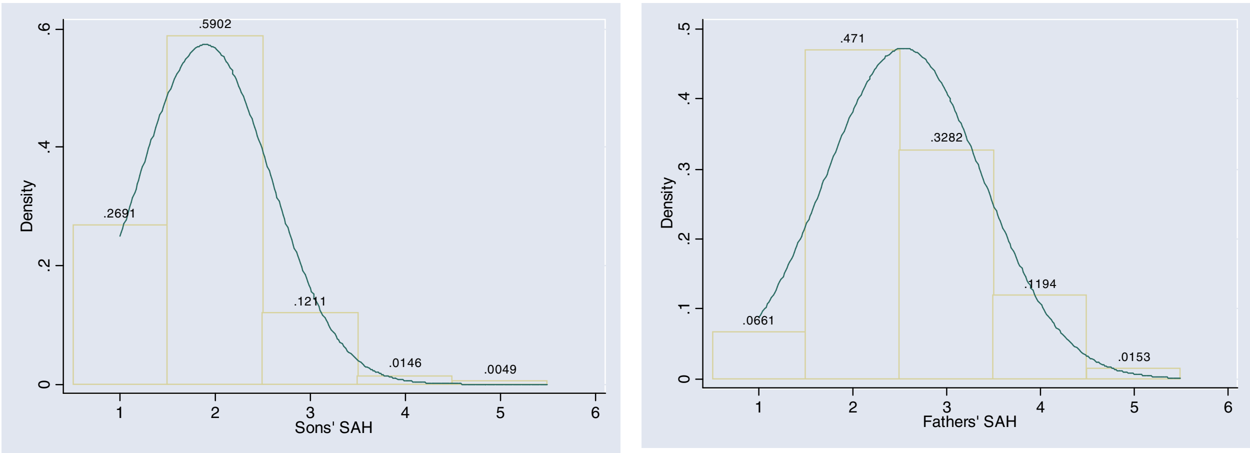
Figure 1

Distribution of SAH: Sons versus Fathers. Country: Spain. Year: 2001



Source: Authors' elaboration based on ECHP data.

Table 1
Ordered probit model estimation.
Dependent variable Son's SAH in 2001.

Year of son's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994														
	-0.2635 (-2.99)							-0.2549 (-2.83)						
1995		-0.2369 (-2.63)							-0.2189 (-2.37)					
	-0.2438 (-2.74)		-0.2564 (-2.84)					-0.2230 (-2.43)		-0.2422 (-2.60)				
1996		-0.2667 (-2.97)		-0.4376 (-4.76)					-0.2532 (-2.73)		-0.3872 (-4.12)			
	-0.3110 (-3.46)		-0.4445 (-4.84)		-0.2547 (-2.72)			-0.2999 (-3.24)		-0.3959 (-4.23)		-0.1981 (-2.07)		
1997		-0.3653 (-4.02)		-0.3333 (-3.57)		-0.2562 (-2.64)			-0.3127 (-3.37)		-0.2848 (-2.97)		-0.1984 (-1.99)	
	-0.3238 (-3.61)		-0.3077 (-3.31)		-0.2223 (-2.31)		-0.2185 (-2.26)	-0.2753 (-3.02)		-0.2516 (-2.64)		-0.1659 (-1.68)		-0.2316 (-2.35)
1998		0.3142 (-3.41)		-0.2241 (-2.34)		-0.2391 (-2.48)			-0.2631 (-2.80)		-0.1700 (-1.73)		-0.2536 (-2.58)	
	-0.3079 (-3.35)		-0.1959 (-2.05)		-0.1869 (--1.96)			-0.2572 (-2.75)		-0.1464 (-1.50)		-0.1953 (-2.01)		
1999		-0.2081 (-2.18)		-0.1386 (-1.45)					-0.1626 (-1.67)		-0.1445 (-1.49)			
	-0.2988 (-3.180)		-0.0919 (-0.97)					-0.2481 (-2.57)		-0.0959 (-0.99)				
2000		-0.1161 (-1.24)							-0.1235 (-1.29)					
	-0.1586 (-1.74)							-0.1649 (-1.78)						
2001														

Note: *z*-statistics are in parentheses

Table 2
Probit model estimation.
Dependent variable Son's SAH in 2001.

Year of son's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994														
	0.4750							0.4354						
1995	(3.29)	0.4042						(2.97)	0.3548					
		(2.68)							(2.32)					
	0.4682		0.6512					0.4179		0.6049				
	(3.17)		(3.94)					(2.78)		(3.59)				
1996		0.6571		0.5181					0.6111		0.4777			
		(4.07)		(3.34)					(3.72)		(3.04)			
	0.6727		0.5728		0.5370			0.6344		0.5373		0.4729		
	(4.28)		(3.63)		(3.40)			(3.97)		(3.37)		(2.92)		
1997		0.3624		0.6277		0.3033			0.3224		0.5794		0.2472	
		(2.47)		(3.90)		(1.90)			(2.17)		(3.51)		(1.50)	
	0.2068		0.5626		0.3337		0.5239	0.1682		0.5081		0.2863		0.4873
	(1.49)		(3.65)		(2.09)		(2.97)	(1.19)		(3.22)		(1.75)		(2.72)
1998		0.5021		0.3717		0.4449			0.4569		0.3227		0.4028	
		(3.38)		(2.34)		(2.63)			(3.01)		(1.99)		(2.34)	
	0.4404		0.2233		0.2967			0.3882		0.1669		0.2544		
	(3.10)		(1.46)		(1.85)			(2.68)		(1.07)		(1.56)		
1999		0.1914		0.1081					0.1338		0.0613			
		(1.28)		(0.70)					(0.87)		(0.39)			
	0.2940		0.2149					0.2324		0.1760				
	(2.02)		(1.38)					(1.55)		(1.11)				
2000		0.1859							0.1391					
		(1.24)							(0.91)					
	0.2332							0.1953						
	(1.60)							(1.30)						
2001														

Note: *z*-statistics are in parentheses

Table 3
Probit model estimation. Average Effects
Dependent variable Son's SAH in 2001.

Year of son's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994														
	0.07160 (3.29)							0.0644 (2.97)						
1995		0.0579 (2.68)							0.0489 (2.32)					
	0.0679 (3.17)		0.0892 (3.94)					0.0584 (2.78)		0.0805 (3.59)				
1996		0.0911 (4.07)		0.0760 (3.34)					0.0822 (3.72)		0.0692 (3.04)			
	0.0953 (4.28)		0.0824 (3.63)		0.0804 (3.40)			0.0868 (3.97)		0.0764 (3.37)		0.0682 (2.92)		
1997		0.0560 (2.47)		0.0919 (3.90)		0.0423 (1.90)			0.0491 (2.17)		0.0812 (3.51)		0.0341 (1.50)	
	0.0334 (1.49)		0.0852 (3.65)		0.0463 (2.09)		0.0669 (2.97)	0.0266 (1.19)		0.0736 (3.22)		0.0392 (1.75)		0.0619 (2.72)
1998		0.0781 (3.38)		0.0514 (2.34)		0.0588 (2.63)			0.0677 (3.01)		0.0440 (1.99)		0.05302 (2.34)	
	0.0715 (3.10)		0.0322 (1.46)		0.0414 (1.85)			0.0600 (2.68)		0.0237 (1.07)		0.0352 (1.56)		
1999		0.0280 (1.28)		0.0159 (0.70)					0.0193 (0.87)		0.0089 (0.39)			
	0.0433 (2.02)		0.0308 (1.38)					0.03367 (1.55)		0.0250 (1.11)				
2000		0.2724 (1.24)							0.201 (0.91)					
	0.0344 (1.60)							0.0283 (1.30)						
2001														

Note: z-statistics are in parentheses